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ABSTRACT

The relationship of comprehension monitoring to writing was investigated in a multiple-measure, longitudinal study of writing skill development. Subjects were approximately 100 elementary school students who were followed during the first three grades. At the end of first grade, relationships were found between ambiguity detection, reading, and writing. Psychometric measures correlated reading with various degrees of strength, but were poor predictors of writing. Reading was firmly related to writing. At the end of second grade, analyses identified two writing measures, language reception, reading, and additional writing scores as descriptors of communication evaluation. The major contrast between first and second year findings lay in the order of entry of discriminating variables. The similarity of first and second year findings was striking, with several psychometric measures failing to contribute to the equation. In the third year of the study, a novel index of the children's text analysis skills was developed and administered. This consisted of an adventure options story in which a duplicitous guide provides directions with multiple possible intentions. (RH)

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Correlates of communication monitoring in the primary classroom

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Because we believe that revision is an essential part of effective written expression (Hayes & Flower, 1986), and because communication evaluation can be seen as one process integral to effective textual modification (Flower, Cary, & Hayes, 1985), a component of our longitudinal study of writing skill development explores the relationship of comprehension monitoring to writing.

If effective written communication depends upon successful text assessment, the production of reader-based as opposed to writer-based texts (Flower et al) would implicate a writer`s capacity to diagnose and repair text which fails to represent adequately communicative intent. A writer or speaker might produce a message lacking in clarity in a variety of aspects: The message could underspecify a referent. It might have several possible implicit interpretations. It might be vague with regard to its intent. It might be contextually misleading, or embedded in a distracting context.

A researcher's quest for an indicator of comprehension evaluation which might have the predictive power of a standardized procedure is fraught with frustration. For example, one popular communication assessment technique, the ambiguity detection paradigm, which typically underspecifies a referent, is frequently constrained by the restricted range of age of children to which any particular set of items can be administered. Most evaluations having been designed for preschool or primary school children. Like many allusive developing psychological mechanisms, one day a child seems not to detect ambiguity, and the next day she does. A bimodal distribution of responses with little variation about the mode is frequently obtained. Nevertheless, at the inception of our project we set out to tap indicators of a range of subject variables which would help in the final analysis to represent how different sorts of children perform as different types of communicators: The good listener, the avid reader, the articulate but not so painstaking speaker, the meticulous, the generative, or the innovative writer. One index we chose to include in our battery was ambiguity detection in message evaluation.

Over a three year period, we spent a great deal of time in the classrooms of almost one hundred children. We started school with them in September of their first primary grade, and stopped collecting their writing samples at the end of their third year in school. Having introduced word processors in one of the three classes with whom we worked, we also assessed the utility of providing such a writing tool in early writing.

Our last SRCD paper (Cameron, Hunt, & Linton, 1987) reported relationships between ambiguity detection, reading, and writing which we found at the end of the first year of our study. Let me summarize quickly these findings. Our psychometric subject measures: Raven's Coloured Progressive Matrices for general level of intellectual functioning, the Peabody Picture Vocabulary Test for verbal skill growth, cognitive style (both the Children's Embedded Figures Test, and the Matching Familiar Figures Test) and ambiguity detection, as evaluated using Bonitatibus and Flavell's (1985) measure correlated with reading with various degrees of strength, but were poor predictors of writing. Reading, however, most solidly related to writing.

Given the 'go/no-go' nature of ambiguity detection (see Figure 1), we decided to take advantage of this discontinuity in the metric to identify performance profiles which might reflect the rough differentiation of this communication evaluation measure. The children were dichotomized with a cutoff at six out of nine correct responses. We computed a discriminant analysis on these data and found: First, cloze reading comprehension and PPVT language scores discriminated detectors; then second, a simple early reading measure; and third, several of our writing measures together discriminated ambiguity detectors. On the basis of these findings, we constructed a tentative explanation involving the central place of reading skill in mediating the children's personal characteristics bearing upon writing performance and ambiguity detection. We concluded our report by suggesting the utility of looking at a variety of other factors next time. First, it seemed appropriate to replicate our efforts in the subsequent years of the programme. Second, we wanted to explore other, perhaps more sensitive measures of reading and writing skill, particularly revision performance. Further, we wanted to include other indices of communication evaluation. So in year two, we used Beal's (1987) ambiguity task as an indicator of more sophisticated communication monitoring. We are grateful to Beal for sharing her stimuli with us.

Beal's technique, which taps sustained communication evaluation, failed to demonstrate the relationships with other measures that Bonitatibus' did. This aroused our curiosity. Intuitions while presenting this procedure to the children led us to examine individual trials which were based on Flavell, Green, and Flavell, 1985. We discovered that one of our two trial orders resulted in comparable levels of performance on each of the three ambiguity trials (Figure 2), whereas the other order resulted in what appears to be a training effect. Although the first presentation of an ambiguity trial resulted in very low levels of performance, the second and third trials seem to indicate that participants were shaped to

detect the underspecification of information inherent in those trials. However, this sequence seems serenipidously to have focussed attention on relevant dimensions. Colour and shape were not balanced within trials, and an unfortunate confounding in the labelling on the shape dimension precluded the opportunity for fruitful replication with those stimuli. Consequently, half of the data are suspect, and the remaining numbers were too small for us to pursue this index for this presentation. The lack of significant correlations may on part reflect this difficulty with items.

We therefore returned to the Bonitatibus measure, as it proved to hold good predictive power even at the end of the children's second year in school. We included additional reading and writing indices administered in grade two. Table 1 gives significant correlations between measures. We conducted a new discriminant analysis on these data. This new analysis identifies at the end of grade two, two writing measures, language reception, and then reading and more writing scores as effective descriptors of effective communication evaluation (Figure 3). At this point, you might note the similarity of these findings to those of the previous discriminant analysis, except for the increased prominence of writing in the equation. What we seem to be able to say, based on these analyses is that to describe the difference between successful and unsuccessful ambiguity detectors in grade one, one should know something about their reading, vocabulary, and then writing. In grade two, to discriminate between a high and a low detector, one should know about the child's writing, vocabulary, and then reading and again more writing.

In reinspecting our distribution of scores on the Bonitatibus scale (Figure 4), we decided that we could more adequately represent performance by dividing the children into three levels of ambiguity detection: Those who got no ambiguous trials correct, those who got all trials correct, and those in between. A discriminant analysis based on this trichotomy differentiated participants using a formula which revealed the following profile of indices: First, Raven and a number of writing scores emerged; then reading and writing alternated several times; followed by PPVT; then another reading and writing alternation. Figure 5 gives the variables and their percent variance in the solution. This analysis shows the increased difficulty involved in attempting a finer discrimination of performance on the Bonitatibus measure. Nevertheless, the alternation of similar writing and reading indices is replicated here, and the importance of having writing measures in year two for discriminating ambiguity detectors is confirmed.

The similarity of the second year findings to those obtained when the children were in first grade are striking, with several psychometric measures failing to contribute to the equation

(and these include cognitive style, IQ, oral verbal skills, and revision performance, as well as home background variables), and with reading and writing playing a significant role in describing the nature of the differentiation of detectors as we variously classified them. The major contrast we observed was in the order of entry of discriminating variables. In grade one, reading preceded writing and led us to a two-step notion of the relationship between writing and communication evaluation, with reading being a potential intervening variable. In grade two, however, writing emerges earlier, and reading follows, reflecting, perhaps, writing's beginning to take a higher priority in our data set as an indicator of communication skill development.

Ambiguity detection is a receptive language skill and may be related only distally to the unequivocal expression of ideas. Perhaps assessment of clarity of expression would better reflect the component of the writing most closely related to communication monitoring. We need to develop valid and reliable indices of both productive and receptive communication assessment. We need to define better the subskills of different aspects of the processes and assess their relationships within a carefully articulated framework. We are beginning to construct such a framework which would delineate the specific components of communication skill involved in both reception and expression which eventuate in the production of reader-based texts.

A problem in the examination of primary school written expression is the scanty evidence for evaluation facility in children at this age. The reality is, young children tend to be sentence generators rather than planners or revisers, so evidence of the latter capacity is hard to come by. We may therefore be struggling with performance floor effects in the expressive skills of interest and ceiling effects on reception-type activities.

Since our third year data are now in, you might most reasonably ask how these findings inform the exploration of the children's communication skill development in the final year of the project. Well, we have, not surprisingly, developed our own index of the childrens' text analysis skills which we administered in year three. Starting with Torrance and Olson's work on literal meaning (1986), and using similar techniques, we developed an adventure options story involving a young adventurer in search of the emperor in his forbidden city. A duplicitous guide provides directions with multiple possible intentions, which we led the children in small-group training to consider. The analysis of these data are preliminary and not simple to interpret. But I must not preempt here our hopes to add our own contribution to delineate factors involved in emergent and allusive text evaluation skill development, and its relationship to clear text production.

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Table 1. Significant correlations among the grade one and grade two measures including ambiguity detection.

	Raven	PPVT	Bonitatibus grade 1	Beal grade 2	Early reading	Cloze grade 1	Cloze grade 2	RMI grade 2	Script grade 1	Script grade 2	# utterances grade 1	# utterances grade 2	Diff. words grade 1	Diff. words grade 2	MLU grade 1	MLU grade 2
Raven			.24		**.41**	**.41**	.24	**-.34**							.27	
PPVT			**.45**	**.29**	.27	.28	**.53**	**-.45**					.28		.26	
Bonitatibus grade 1				.29	**.34**	**.34**	.29	-.29								
Beal grade 2						**.34**	.24	-.29								
Early reading						**.52**	**.49**	**-.46**					.29	**.38**		.33
Cloze grade 1							**.64**	**-.62**		**.34**			**.47**	**.38**		
Cloze grade 2								**-.57**		.31			**.34**	**.41**		.24
RMI grade 2													**-.41**			**-.37**
Script grade 1											**.50**		**.63**			
Script grade 2												**.68**	**.37**	**.71**		
# utterances grade 1														**.71**		
# utterances grade 2														**.78**		**-.38**
Diff words grade 1														**.39**	**.37**	
Diff words grade 2																
MLU grade 1																

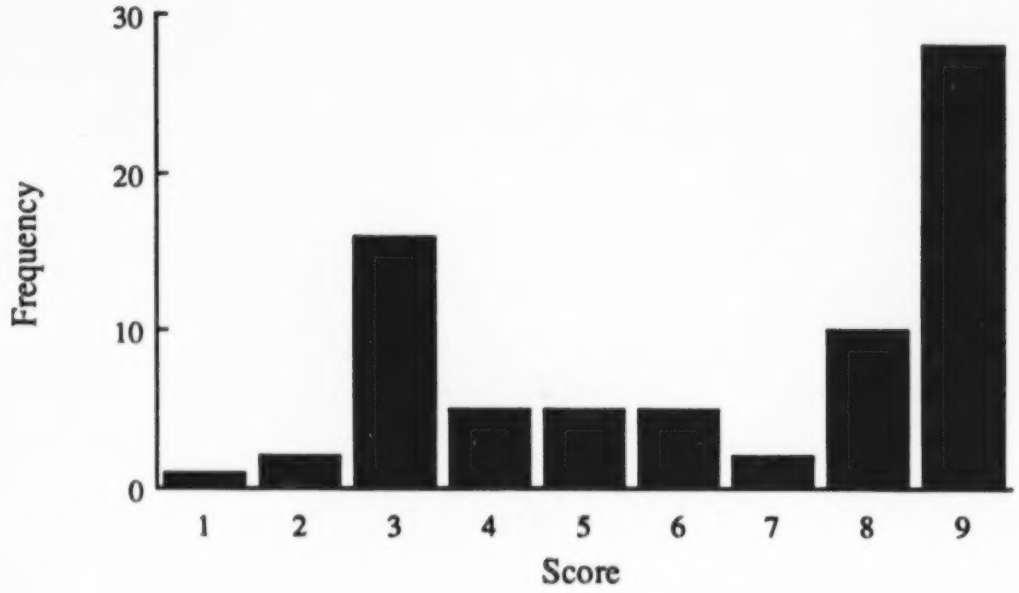

Figure 1. Distribution of scores for the grade one communication monitoring task.

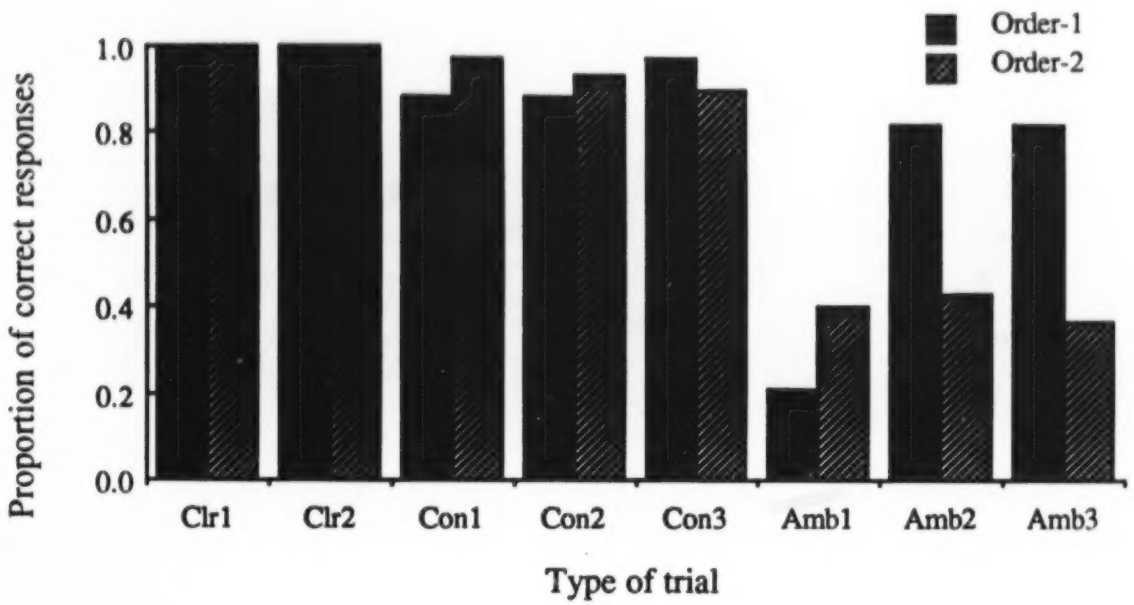

Figure 2. Distribution of scores for the grade two communication monitoring task.

Order of entry for variables into the equation	% Variance in the solution
# utterances gr 2	36
+Script gr 2	16
+PPVT	10
+Cloze gr 1	19
+RMI gr 2	13
+Diff words gr 1	6

Variables available, but not used for the analysis:

Raven	Matching Familiar Figures
Early Reading	Script gr 1
Holistic gr 1	Holistic gr 2
# Utterances gr 1	MLU gr 1
Diff words gr 2	MLU gr 2
Cloze gr 2	

Figure 3. The measures used to discriminate two levels of communication monitoring.

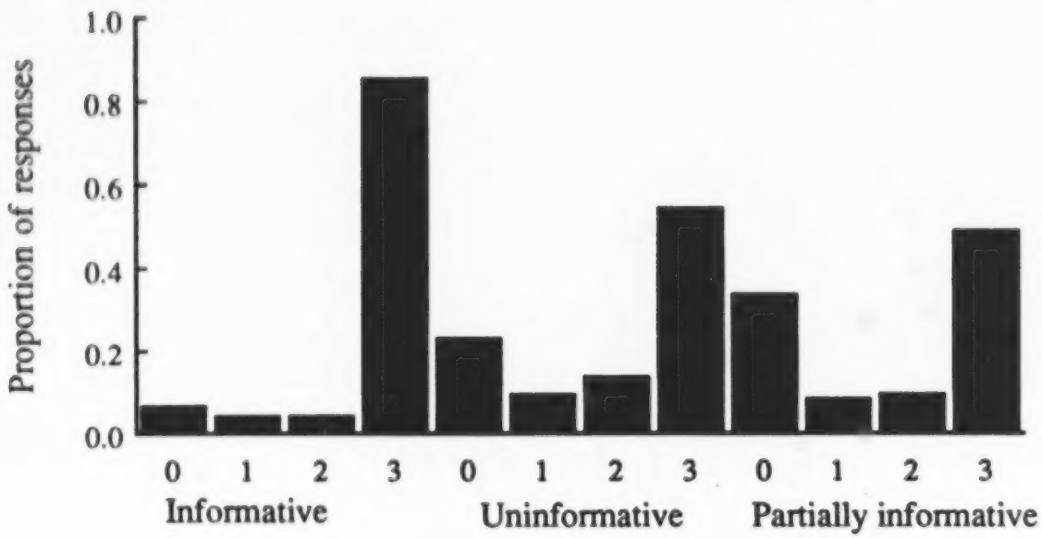

Figure 4. Distributions of scores for each trial type for the grade one communication monitoring task.

Order of entry for variables into the equation	% variance in the solution	
Raven	6	
+Script gr 2		24
+Diff words gr 2	—	
+# utterances gr 1		13
+Cloze gr 1		4
+Diff. words gr 1	9	
+RMI		5
+# utterances gr 2	21	
+MLU gr 2	8	
–Diff words gr 2	—	
+PPVT	3	
+Early reading	4	
+Script gr 1	3	

Variables available, but not used for the analysis:

Matching Familiar Figures	Script gr 1
Holistic gr 1	Holistic gr 2
Diff words gr 1	MLU gr 1
Cloze gr 2	

Figure 5. The measures used to discriminate three levels of communication monitoring.